Lection 7

# NETWORKS AND TELECOMMUNICATIONS.

## СЕТИ И ТЕЛЕКОММУНИКАЦИИ

# CONTENTS

- End devices, data transfer devices, transmission medium.
- Types of networks.
- Stack protocols: TCP/IP, OSI. IP addressing.
- Wire and wireless network technologies.
- DHCP protocol.
- Technologies of connection to the Internet.

# DICTIONARY

| | |
|---|---|
| End device | Конечное устройство |
| Network | Сеть |
| Switches | Коммутатор |
| Twisted pair | Витая пара |
| Telecommunications | Телекоммуникации |
| Equipment | Оборудование |
| Transfer | Передача |

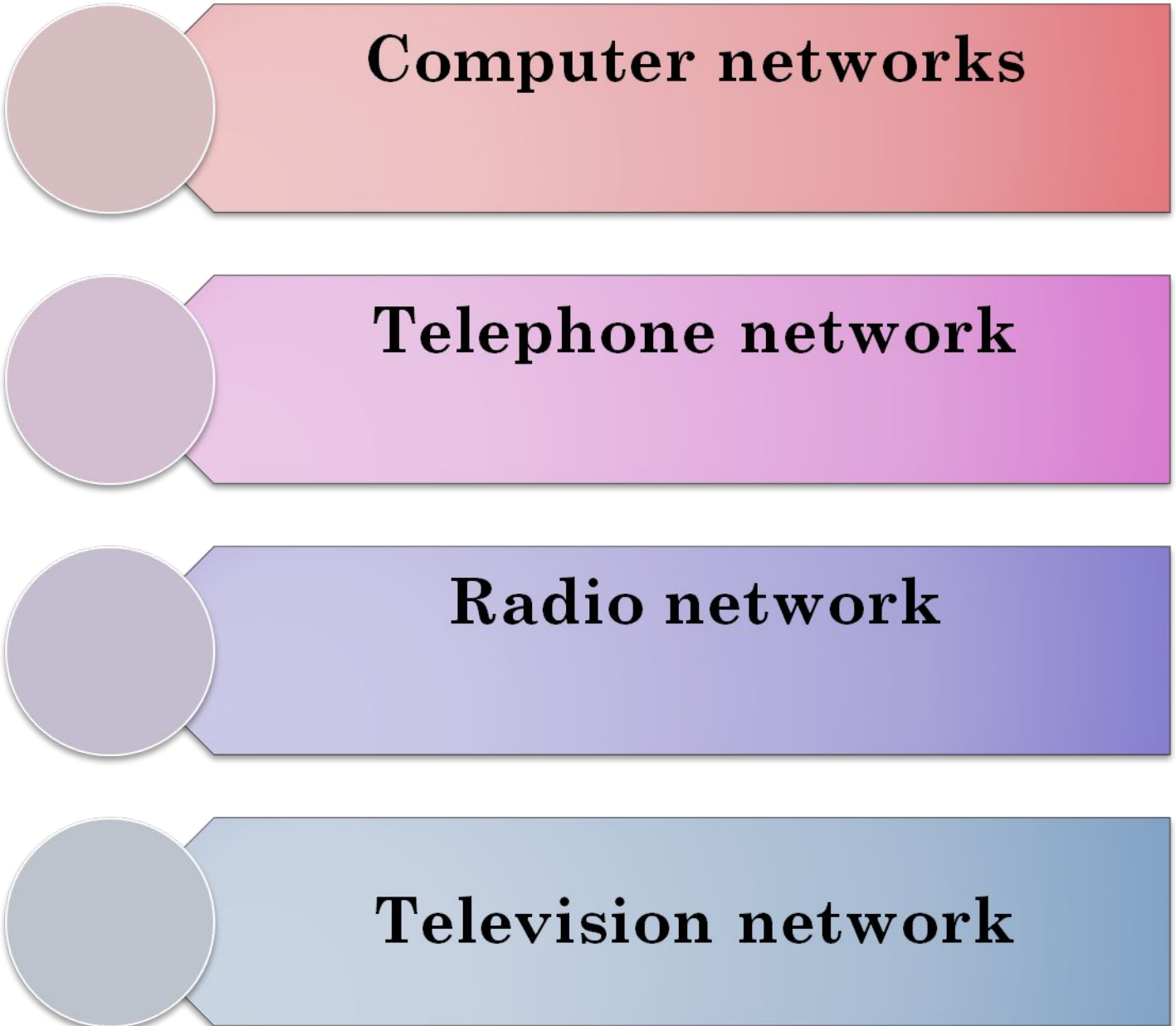
# TELECOMMUNICATIONS

- **transmission and reception of any information on the distance for different electromagnetic systems (wired and wireless communication channels).**

# TELECOMMUNICATION NETWORKS

- system of technical means by which telecommunications are implemented

# TELECOMMUNICATION NETWORKS



# COMPUTER NETWORK

- combination of computers and telecommunications equipment, providing communication of the computers on the network.

# END DEVICES

- Computers
- Network printers
- VoIP phones
- Cameras
- Mobile devices

# DATA TRANSFER DEVICE (INTERMEDIATE DEVICES)

network adapters

repeaters, switches, hubs, multiplexers, bridges, routers

gateways and modems, terminating the operation of computers by data transmission channels.

# ENVIRONMENT INFORMATION TRANSFER

- lines or communication channels by which information is exchanged between computers

# MEDIA DEVICES

Copper transmission medium (Cooper media)

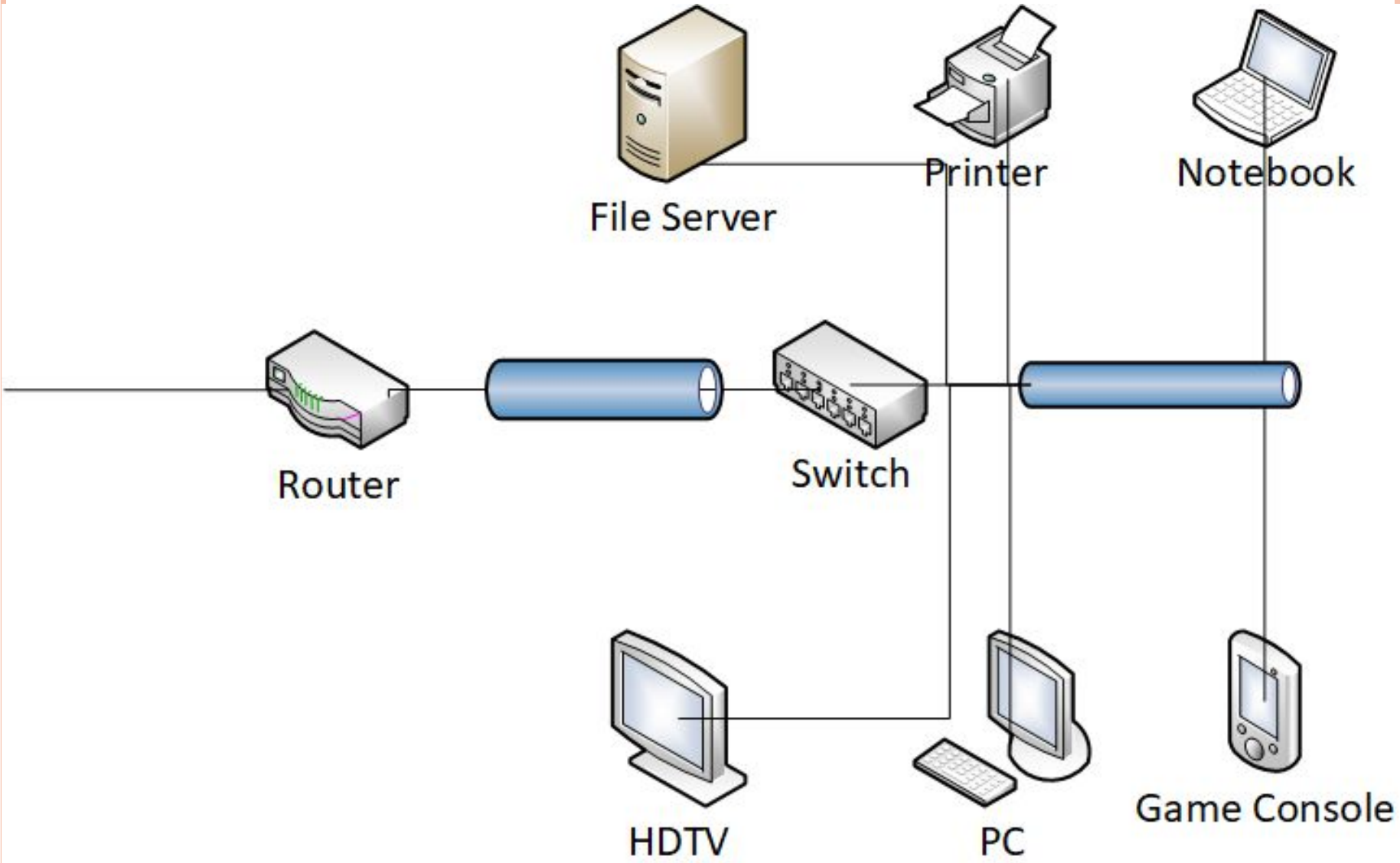
Twisted pair

Coaxial cable

Fiber optic cable

Wireless media (Wireless media): Wi-Fi, Mobile communication, Bluetooth, Satellite communications

# BASIC HARDWARE COMPONENTS OF A COMPUTER NETWORK



# SERVERS

- The servers are sufficiently powerful computers, since the need to provide high speed data transmission and query process
- File server performs the following functions:
  - data storage;
  - archiving of data;
  - synchronize data changes by different users;
  - data transfering.

# CLIENT

- The client is called a workstation on which the software is installed, providing the solution of problems generated in the process of the user.

# COMMUNICATION CHANNELS

- Communication channel (or communication line), the physical medium in which information signals are transmitted to the data communication equipment.

# DATA TRANSMISSION EQUIPMENT

- The data transfer equipment serves for the direct connection of the computers to the communications line.

# NETWORKS BY TERRITORIAL PREVALENCE

Local Area Network - LAN

Regional (Metropolitan Area Network) - MAN

Global (Wide Area Network) - WAN

# NETWORKS BY SPEED OF INFORMATION TRANSFER

- Low speed
- Mid speed
- High speed

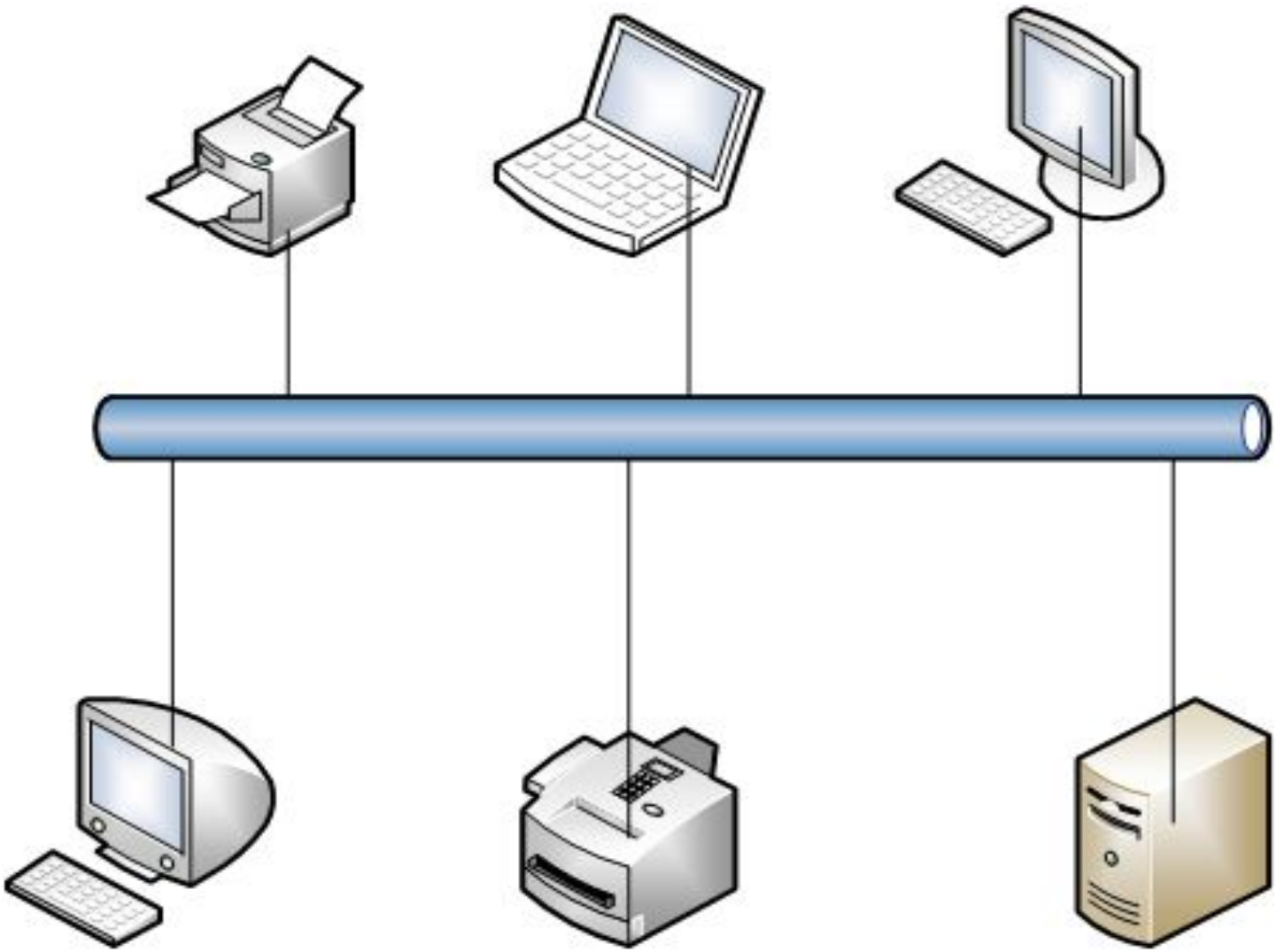
# NETWORKS BY THE MANAGEMENT METHOD

| Peer-to-peer | Network with a dedicated server |
| --- | --- |
| • Одноранговая сеть | • Сеть с выделенным сервером |

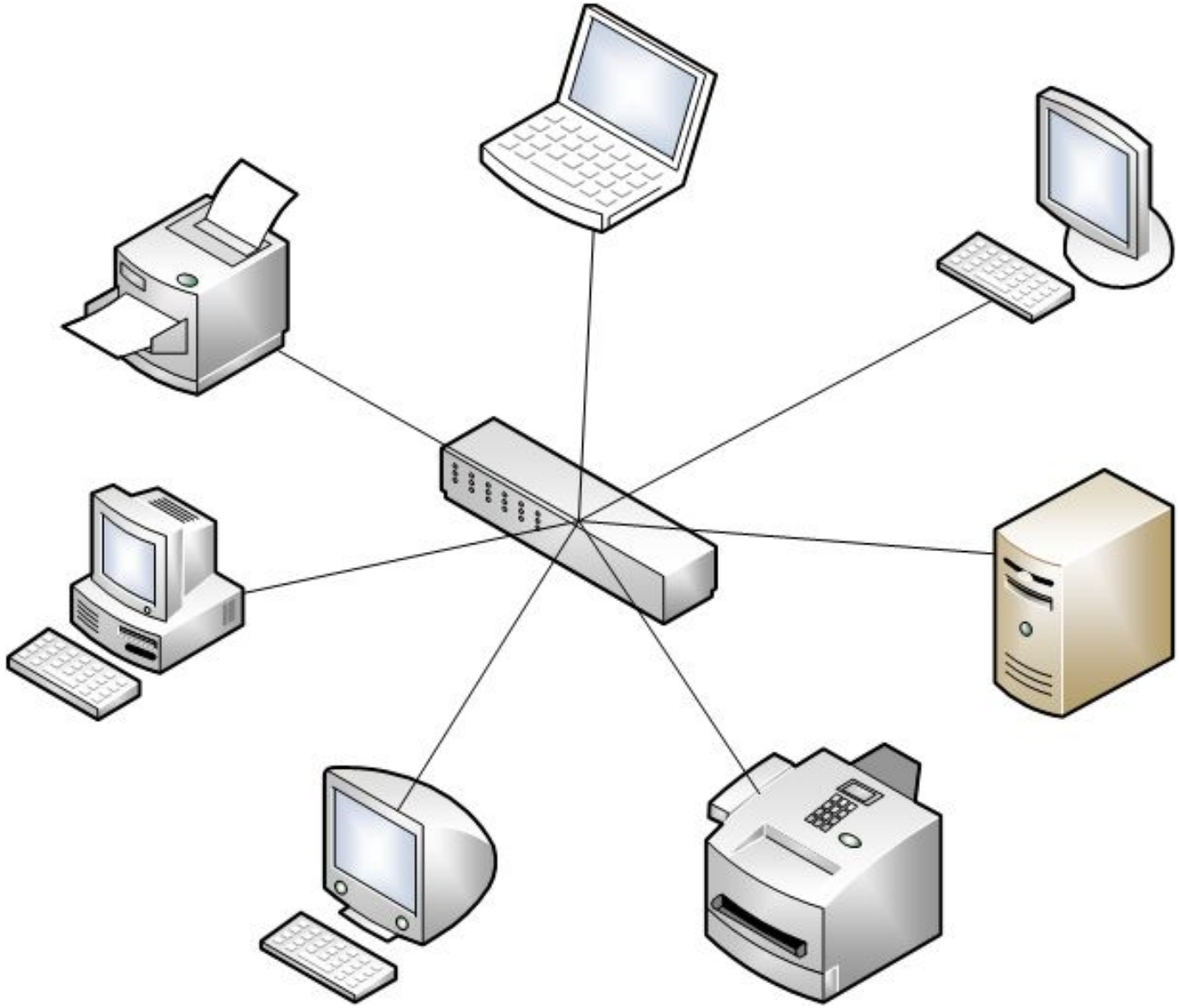
# BASIC TOPOLOGY

- Under the topology (layout, configuration, structure) of a computer network generally refers to a physical location of the computers on your network, one on one, and a way to connect them with lines.

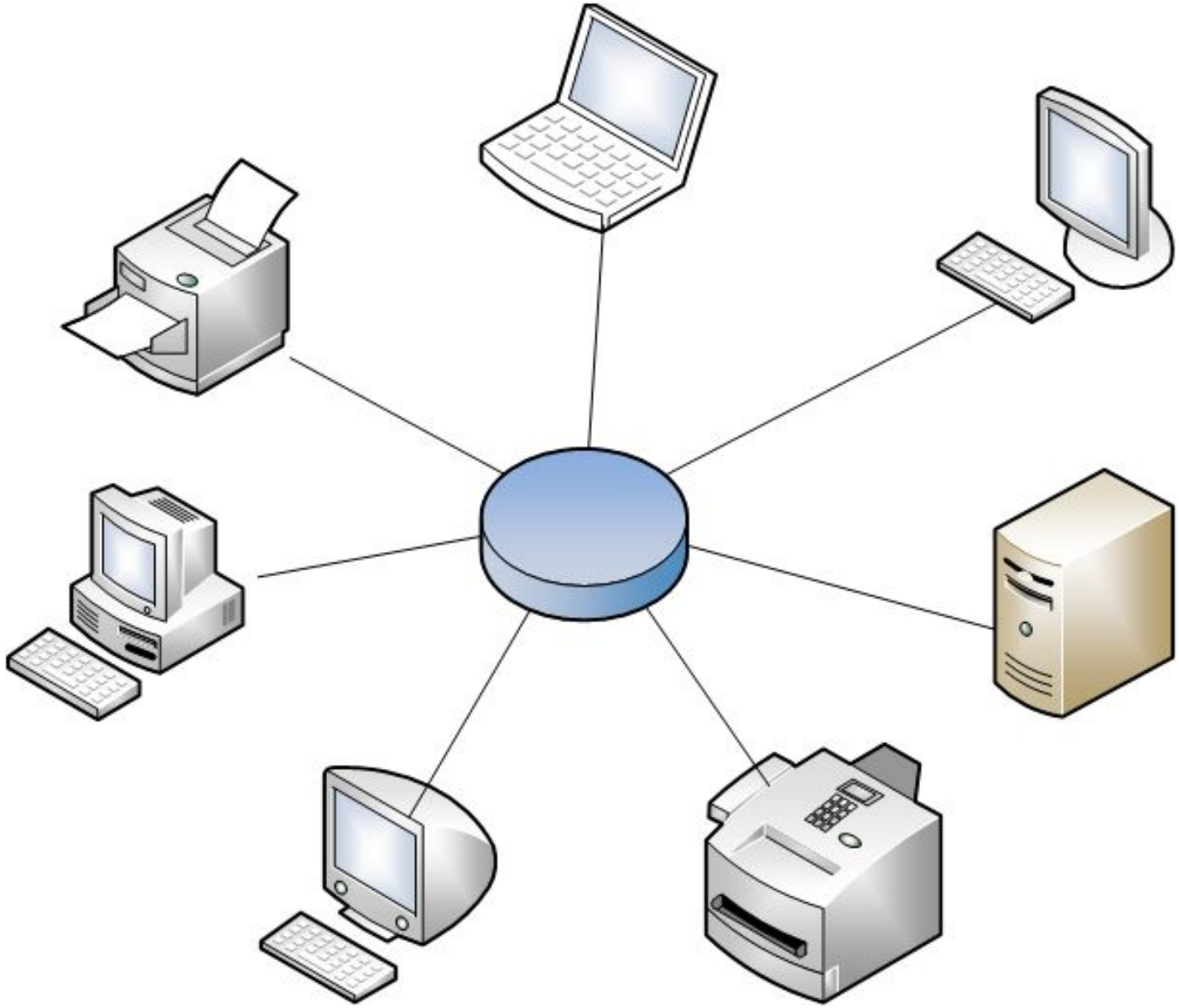
# NETWORK TOPOLOGY BUS



# NETWORK TOPOLOGY STAR



# NETWORK TOPOLOGY RING

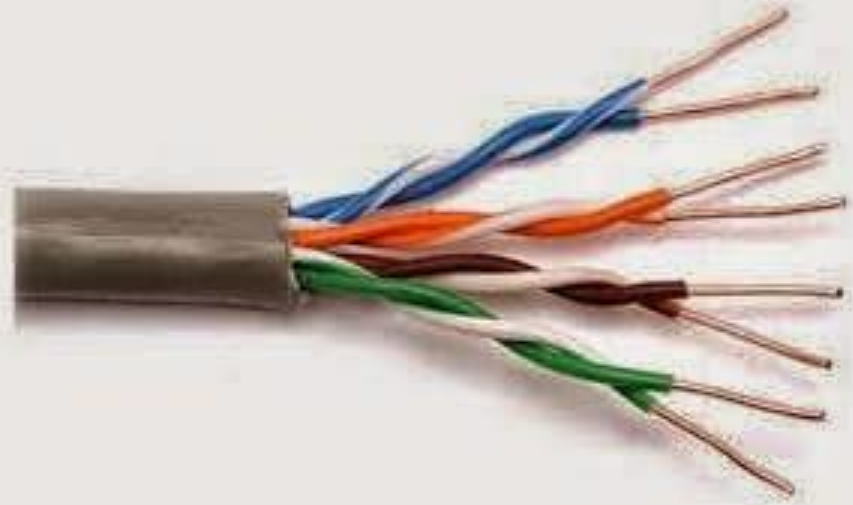


# NETWORK CABLE OF THE PHYSICAL TRANSMISSION MEDIUM

| Type of cable | The maximum transmission distance | The maximum transmission rate |
|---|---|---|
| coaxial cable | 185-500 m | 10 Mbit/sec |
| ≪twisted pair≫ | 30-100 m | 10 Mbit/sec – 1 Gb/sec |
| fiber optic | 2 km | 10 Mbit/sec – 2 Gb/sec |

# COAXIAL CABLE

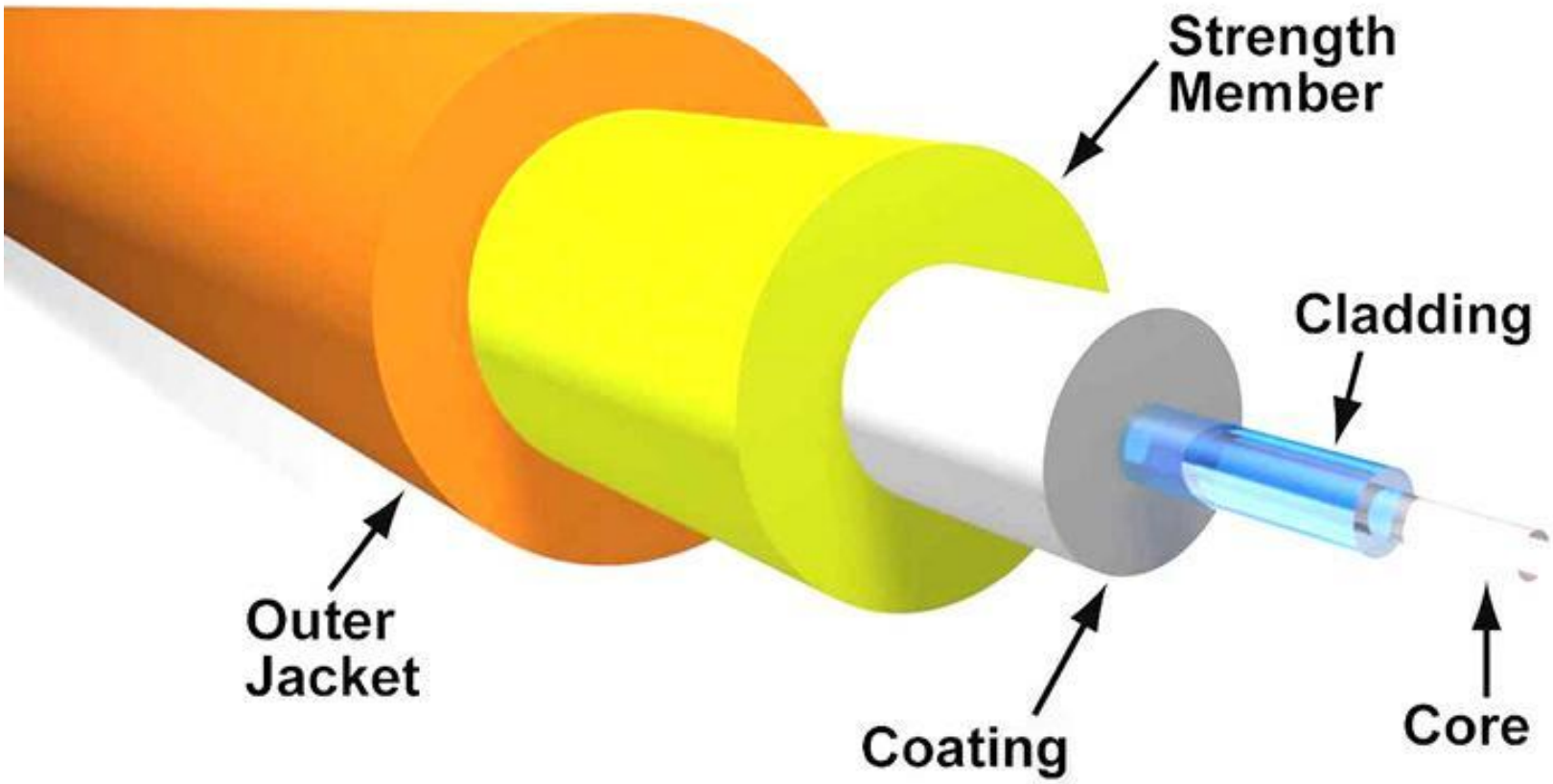
# TWISTED PAIR



UTP Cable

STP Cable

# FIBER OPTIC CABLE



# PROTOCOL

- a set of agreements about the ways of presenting the data that ensure their transmission in the desired direction and correct interpretation of data by all participants in the information exchange

# OSI MODEL

- Protocols of OSI are seven-layer and are known as protocols of basic reference model of open systems interconnection.

# OSI MODEL

**7 Application - app access to the network**

**6 Presentation - data conversion**

**5 Session - organization of the communications between endpoint machines**

**4 Transport - divides the information flows at a sufficiently small fragments (packets) for transmission**

# OSI MODEL

**3 Network - divides of users into groups.**

**2 Data Link - ensures the creation, transmission and reception of data frames**

**1 Physical - receives data packets and converts them into optical or electrical signals**

# TCP/IP

- a set of network data transfer protocols used in networks, including the Internet

# TCP/IP

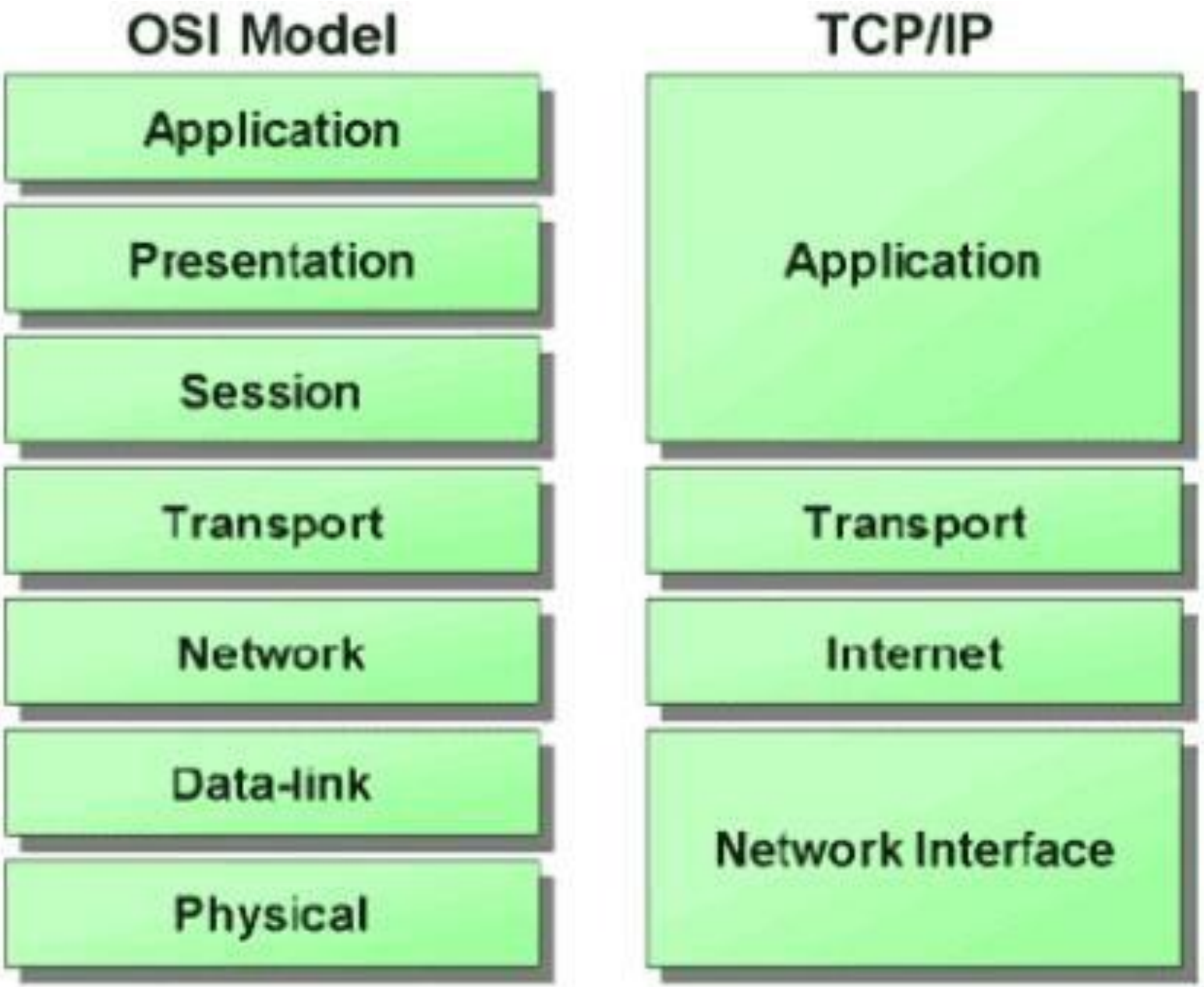
1 Application

2 Transport

3 Internet

4 Link

# OSI – TCP/IP


OSI Model
TCP/IP
Application
Presentation
Session
Transport
Network
Data-link
Physical
Application
Transport
Internet
Network Interface

# KINDS OF NODES' ADDRESSES

**HardWare**

- Аппаратные

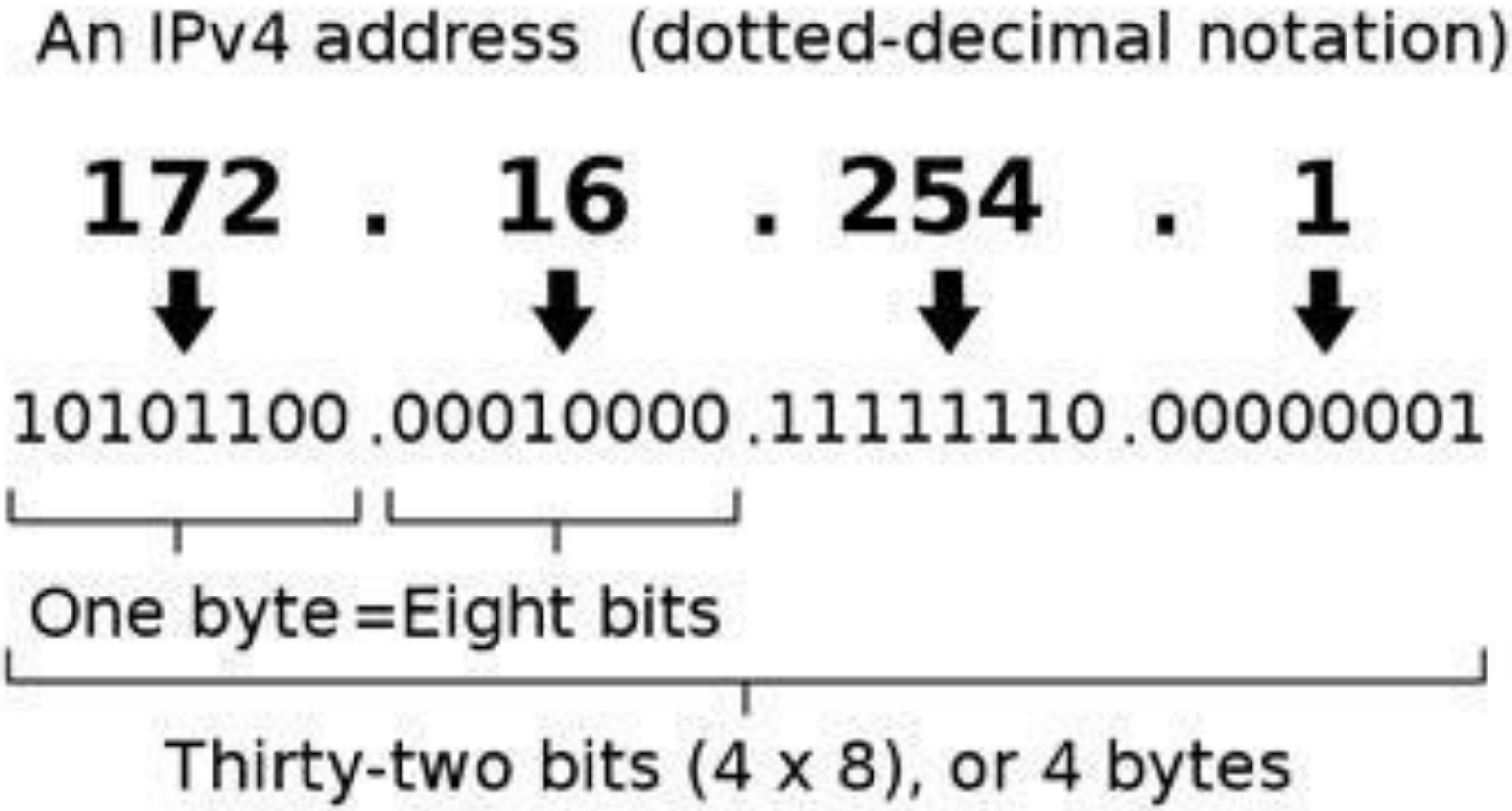
**Symbol**

- Символьные

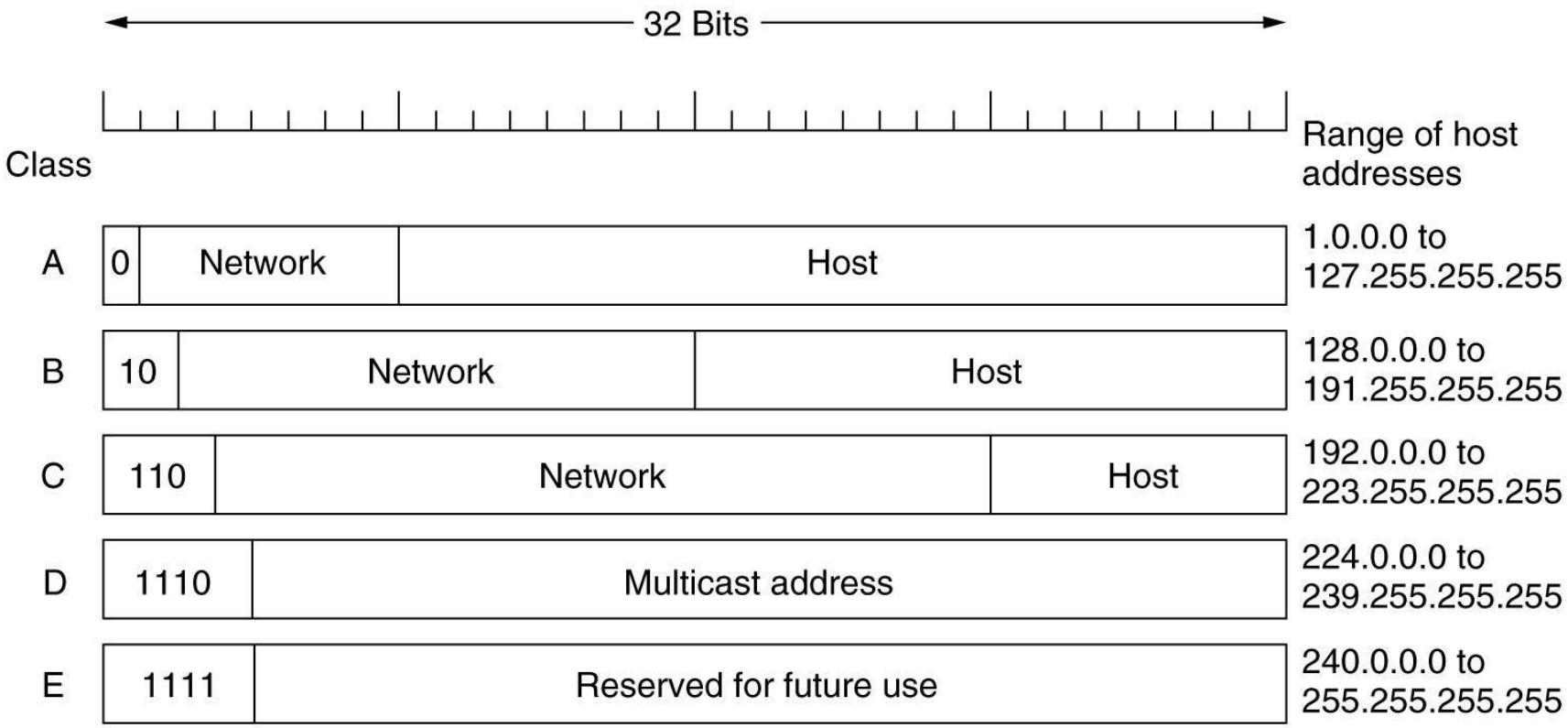
**Numeric (IP)**

- Числовые

# IP ADDRESS

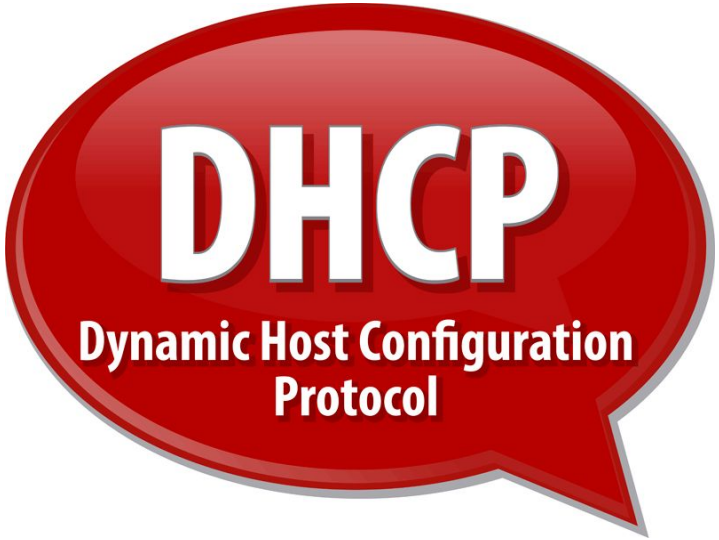

An IPv4 address (dotted-decimal notation)
172 . 16 . 254 . 1
10101100 .00010000 .11111110 .00000001
One byte =Eight bits
Thirty-two bits (4 x 8), or 4 bytes

# NETWORKS' CLASSES



# DYNAMIC HOST CONFIGURATION PROTOCOL (DHCP)

- was developed in order to perform dynamic assignment of IP addresses



# TYPES OF DHCP IP ADDRESSES' ASSIGNMENT

Dynamic

Manual

Automatic static

# WIRED NETWORK TECHNOLOGIES

- LAN (Local Area Network)
- DSL (Digital Subscriber Line)
- Cable TV
- OAN (Optical Access Networks)

# WIRELESS NETWORK TECHNOLOGIES

WPAN — Wireless Personal Area Networks (Bluetooth)

WLAN — Wireless Local Area Networks (Wi-Fi)

WMAN — Wireless Metropolitan Area Networks (WiMAX)

WWAN — Wireless Wide Area Network (CSD, GPRS, EDGE, EV-DO, HSPA)

# INTERNET CONNECTION TECHNOLOGIES

- Telephone line (channel switching)
- DSL, ADSL
- Broadband access
- ISDN
- Cable TV network
- Satellite channel
- PLC
- 1G,2G,3G,4G,5G

# CONCLUSION

- **Computer network is a combination of computers and telecommunications equipment, providing communication of the computers on the network**
- **Network's work is based on TCP/IP protocols.**
- **3 types of addresses in networks.**
- **8 types of Internet access technologies .**